Claims

1. A lip synchronization test method for a DTV (digital TV) receivers, the method comprising the steps of:

generating a digital audio stream having a frame index inserted therein and a video stream having a Transient Effect Area Test Signal (TATS) inserted therein;

comparing the waveform of the time-indexed audio signal with that of the time-indexed video signal; and

measuring and calculating a time difference d_t between the audio and video signals based upon the time indexes of the time-indexed audio and video signals.

2. The lip synchronization test method according to claim 1, wherein an n^{th} audio frame time t_a measured from the time-indexed audio frame waveform is calculated t_a = one audio frame time X n [sec].

3. The lip synchronization test method according to claim 1, wherein an m^{th} video field time t_v measured from the time-indexed video frame waveform is calculated t_v = m/field rate (field/sec) [sec].

4. The lip synchronization test method according to claim 1, wherein the audio frame index and the video field index are looped back at a predetermined time period.

5. The lip synchronization test method according to claim 1, wherein the audio and video time difference d_t is expressed as

$$d_t = t_a - t_v - t_{dav} - t_{DTSoffset},$$

wherein t_a is an n^{th} audio frame time, t_v is an m^{th} video field time corresponding to the n^{th} audio frame time, t_{dav} is an audio and video time difference measured with a measuring device and $t_{DTSoffset}$ is a Decoding Time Stamp (DTS) initial

value.

6. The lip synchronization test method according to claim 1, wherein the audio frame index is formed by inserting a predetermined number of waveforms into the digital audio stream at a predetermined time corresponding to each audio frame.

7. The lip synchronization test method according to claim 1, wherein the time index (TATS) of the video signal is formed by inserting a 4-level field index into the digital video stream based upon a line corresponding to a Transparent Effect Area (TA) of each video frame.

8. A lip synchronization test method of Digital TV (DTV) receivers, the method comprising the steps of:

generating digital audio and video streams each having a time index inserted therein;

comparing the waveform of the time-indexed audio signal with that of the time-indexed video signal; and

measuring and calculating a time difference d_t between the audio and video signals based upon the time indexes of the time-indexed audio and video signals.

9. The lip synchronization test method according to claim 8, wherein the audio and video time difference d_t is expressed as

$$d_t = t_a - t_v - t_{dav} - t_{DTSoffset},$$

wherein t_a is an n^{th} audio frame time, t_v is an m^{th} video field time corresponding to the n^{th} audio frame time, t_{dav} is an audio and video time difference measured with a measuring device and $t_{DTSoffset}$ is a Decoding Time Stamp (DTS) initial value.

10. The lip synchronization test method according to

claim 8, wherein the time index is inserted into a Transient Effect Area (TA).

11. The lip synchronization test method according to claim 8, wherein the time index of the video signal indexes a video field number.

12. The lip synchronization test method according to claim 8, wherein the time index of the audio signal indexes an audio frame number.

13. The lip synchronization test method according to claim 12, wherein the time-indexed signal of the audio signal includes time information and signal number.

14. A lip synchronization test system for Digital TV (DTV) receivers comprising:

means for detecting a time index signal contained in an audio signal to discriminate a corresponding audio frame number, and calculating a corresponding audio frame time t_a from the audio frame number;

means for detecting a time index signal contained in the video signal to discriminate a corresponding video field number and calculating a corresponding video field time t_v from the video field number;

means for measuring a time difference between the audio and video signals; and

means for calculating a lip synchronization time d_t based upon the time difference between the audio and video signals, the corresponding audio frame time and the video field time.

15. The lip synchronization test system according to claim 14, wherein the audio time calculating means include:

audio time index detecting means for detecting a time

index signal contained in the audio signal;

audio frame number discriminating means for decoding the detected audio time index signal to discriminate the corresponding audio frame number; and

calculating means for calculating the discriminated audio frame number with an audio one frame time to calculate the corresponding audio frame time t_a.

16. The lip synchronization test system according to claim 14, wherein the video time calculating means include:

a video time index detecting means for detecting a time index signal contained in the video signal;

a video field number discriminating means for decoding the detected video time index signal to discriminate the corresponding video field number; and

a calculating means for calculating the discriminated video field number with a video field rate to obtain the corresponding video frame time t_v.

17. The lip synchronization test system according to claim 14, wherein the lip synchronization time calculating means calculates the audio and video time difference d_t expressed as

$$d_t = t_a - t_v - t_{dav} - t_{DTSoffset},$$

wherein t_a is an n^{th} audio frame time, t_v is an m^{th} video field time corresponding to the n^{th} audio frame time, t_{dav} is an audio and video time difference measured with a measuring device and $t_{DTSoffset}$ is a Decoding Time Stamp (DTS) initial value.